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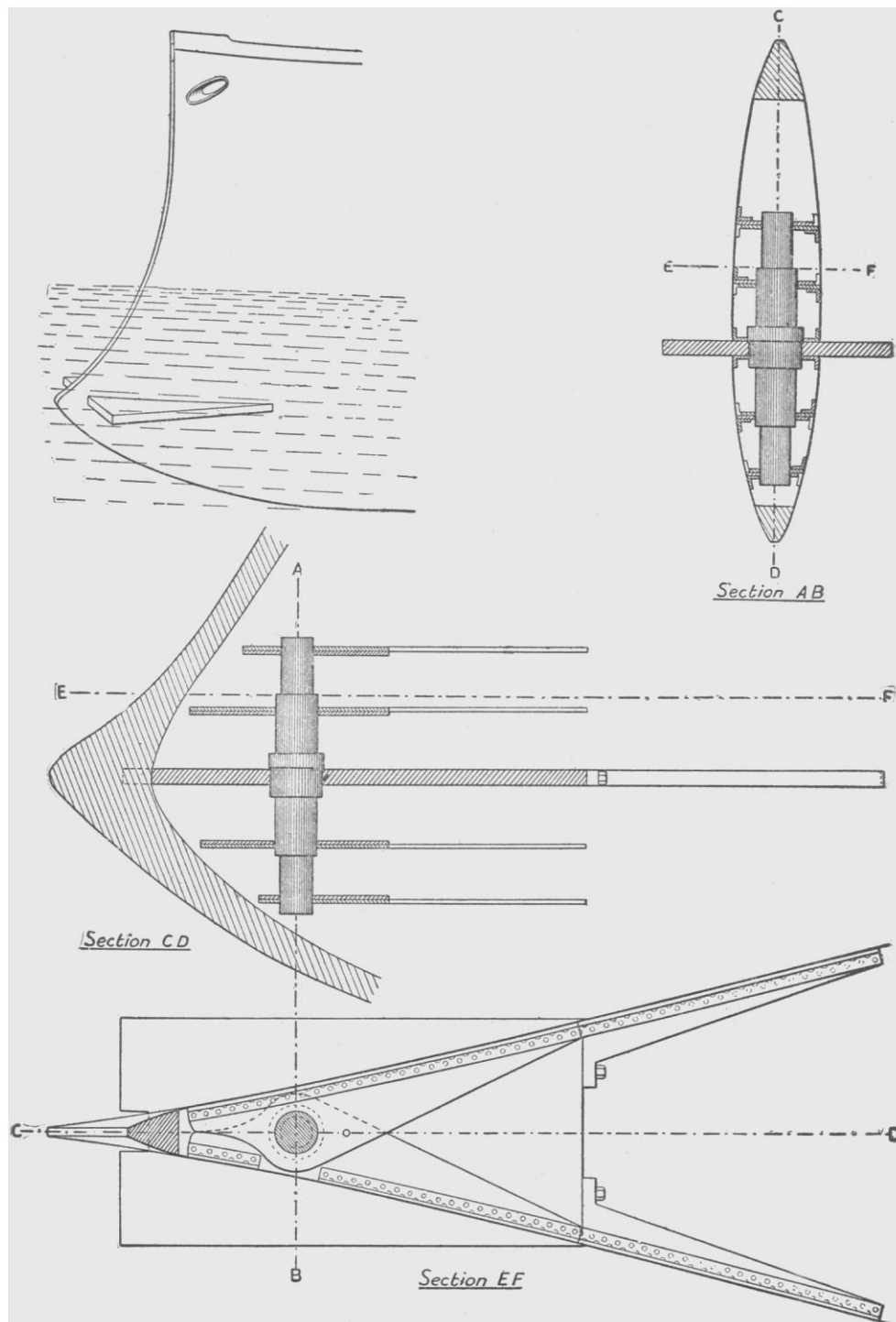
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THE WARD RAM FOR WAR-SHIPS.

IN a recent article on "Naval Wars of the Future," Admiral Porter, who is doubtless our highest authority on such matters, says, "Then there is the ram with which most of the sea-fights of the ancient Greeks were won. All foreign navies have vessels fitted as rams, which are expected to perform great service in

in 1878, by bad management, struck the 'Grosser Kurfurst' in the side and under water. The latter ship was sunk, and the former so damaged that she had great difficulty in getting into port."

In a similar irreverent way he says, "Neither fleet has what may properly be called 'rams:' both trust to the underwater 'snout,' which caused the sinking of the 'Grosser Kurfurst' and the disabling of the 'König Wilhelm.'" He also puts in the mouth of a



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time of war. The 'ram' is simply an elongation of the bow under water; and although, no doubt, a vessel so fitted would inflict great injury on an enemy by running into her, she would be liable to injure herself quite as much, and go to the bottom with her foe. No modern rams have been tried in war, and ships so constructed will most likely be failures. In proof of this, take the case of the armor-clad frigate 'König Wilhelm,' of the German Navy, which

supposed English naval officer the saying, "Why have not the admiralty built proper rams, for those are the largest kind of projectiles?"

This description of a "proper ram" is certainly correct, for the blow given by a ship weighing, say, five thousand tons, moving at even as slow a rate as twelve miles per hour, would have many times the force of the heaviest projectile from the largest ordnance

ever constructed. The method of utilizing this force for the destruction of an enemy's ship, by vessels as now built, is to seize the opportunity when the intended victim is aground, at anchor, or in some way not in motion, and then to strike her as nearly at right angles to the exposed side as possible. This, of course, causes the complete stoppage of the attacking vessel, after which the engines are to be reversed, and the ram released. If the blow is given at an acute angle, or the attacked vessel is in rapid motion across the line of attack, the wrenching force produced would be perhaps more dangerous to the giver than to the receiver, owing to the lack of lateral strength in the form of ram as now universally built.

The consequence of this well-known lateral weakness of the regulation ram is, that all naval officers share Admiral Porter's opinion that no ship has yet been constructed that would serve the purpose of a ram; and they recognize the fact that the cases are few and far between in which a commander would be justified in risking his ship and his reputation in what he would himself feel to be a most reckless form of attack.

In view of this well-known idea, it seems strange that the form of ram shown in our illustration has not long ere this forced itself into use, as the thing, when once seen, looks too obvious and simple not to have come forward to fill the acknowledged want.

With a ram formed as this one is, the most advantageous angle of attack is precisely that which would be the most dangerous with the usual pattern, or, say, about twelve degrees. Every sailor knows how handily he can lay his ship alongside of a wharf or another vessel in such a manner as to foul his anchor when it is hanging at the bow, and this is the manœuvre by which he can use this ram with the best effect. The corner of the heavy iron plate will, as it touches the enemy's side, enter it with ease as far as the projection from the side of the bow will allow, and will cut a long furrow, plough-like, under the water-line. This attack does not necessitate any stoppage of the ship which acts on the offensive, as is the case where the blow is given "end on," which is an advantage of great moment in a strong current, a narrow passage, or when crowded by hostile or friendly vessels.

Having delivered her blow in passing, she is at once on her course again, and ready for whatever is required by the exigencies of the engagement.

The ram here illustrated, for use on war-vessels, is the invention of Mr. John F. Ward, M.Am.Soc.C.E., of Jersey City, N.J. Ships' rams, as usually constructed, present a sharp vertical cutting edge with comparatively little horizontal width. Such a ram, by striking squarely the side of an enemy's ship, may doubtless inflict much damage; but there is also great danger of wrenching off the ram of the attacking ship, by reason of a glancing blow or the swinging action of a strong current, or of so straining the frame of the attacking vessel that the ram would be practically valueless for further service.

The present device is intended to overcome the inherent disadvantages of the older form, and it accomplishes this end by a departure from former practice as radical as it is simple. Instead of a vertical plane of attack, we have here a horizontal ram, with projecting ends extending transversely through the bows of the war-ship, and presenting on either side of the stem an attacking angle of strong and heavy iron plate, so located as to strike below the water-line, and to be effective at almost any angle of approach. The most dangerous blow of all to an enemy with this ram would probably be an almost parallel glancing attack, which would tear a long, narrow path through the plating of the enemy's ship, and rupture any frame in the track of the ram. A hole of this nature would be most difficult to stop, and would to a considerable extent cancel the advantages of water-tight compartments in a war-vessel.

The drawings show the ram as arranged in the bow of the ship, though of course this arrangement might be modified at the will of the naval constructor, and in accordance with the type of vessel upon which it is to be used. The plate as shown here is about 6 inches thick, and about 8 feet wide and 16 feet long. Through the forward half of this plate passes a steel shaft about 24 inches in diameter, which is further braced 2 feet and 4 feet above and below the main plate by other stiffening plates, about 1½ inches thick, strongly secured to the sides of the ship by angle-iron; and

the main plate is also in like manner connected with the ship's sides. The purpose of this steel shaft and the supplementary plates is to transmit the strains coming upon the angle of attack of the main plate to as great a surface as possible in the bow of the ship. In the plan shown, this surface distribution amounts to about 269 square feet.

The plan or "Section E F" is proposed for the adaptation of this ram to a war-ship already built, in which the difficulty of adjusting a large single plate to the position required for the shaft is overcome by making the plate in pairs. This plan also shows heavy bars or brackets in the rear of the ram-plate, for further connecting it with the ship's side, and transmitting strain from the ram to the ship.

SANITARY CEILINGS AND WALLS.¹

MUCH has been done by the sanitarians of the country, and especially the Board of Health of this State, to try to enlighten the people sufficiently in regard to the unsanitary nature of the prevailing modes of coating, or recoating and ornamenting, the ceilings and walls of rooms for domestic habitation; yet much remains to be done in this direction. The reason is, no doubt, that those who strongly condemned the prevailing modes offered no relief, gave no way of any kind by which the people could even plainly cover their ceilings and walls. Professor R. C. Kedzie, in his lectures when president of the State Board of Health some years ago, advised his audience to forego the pleasure of decorated walls, or to simply whitewash them with lime, rather than stop what he terms "wall-respiration" by sealing or strangling the pores in the plaster with paste and paper, kalsomine, or paint. He illustrated to his audience, by means of blowpipes filled with dried mortar, and some coated with paper, others with paint and kalsomine, how readily air passes through walls of ordinary mortar and with stucco finish (the so-called hard finish), or when simply whitewashed, and how this "wall-respiration" was prevented by all the other modes; and under the professor's directions the State published a book entitled "Shadows from the Walls of Death," and placed copies of it in all the public libraries, with this Bible inscription on its cover: "And behold if the plague be in the walls of the house with hollow streaks, greenish or reddish, then the priest shall go out of the house to the door of the house, and shut up the house seven days. . . . And he shall cause the house to be scraped within round about, and they shall pour out the dust that they scrape off without the city into an unclean place."

This book contains seventy-five specimens of arsenical wall-papers, all gathered from the paper-stores of Michigan, and gives authenticated cases of poisoning from many of these papers; and on all of them arsenic was found in the colors, not only green, but nearly all colors and tints, and some also in making the finish or lustre. A year or two ago the sanitarians of Massachusetts made quite an effort in this direction, introducing a bill in the Legislature to prohibit the sale of such paper; but the paper-men used their influence against it, sent representatives to the Legislature, who claimed or pretended to prove that there was no foundation to the claims made by the sanitarians, and the bill was defeated.

Now, while there are many cases where the people have suffered from arsenical wall-paper, I am fully satisfied from a thorough study of this subject of wall-coatings constantly for fifteen years, and quite a portion of the time applying the same, removing old papers and kalsomine, and from talking with sanitarians and scientists on the subject, that a greater amount of sickness is caused from other conditions of the walls, and conditions that generally prevail, and in nearly every house, than from the very dangerous arsenical wall-papers; and I believe in many of the cases cited, where it was proven that the patients had suffered in rooms coated with paper which proved on examination to contain arsenic, that other conditions connected with the same paper and walls contributed largely to the troubles.

Before going further, I wish to explain that I will show, before the completion of this paper, how people may decorate their rooms in a way that is approved of by the sanitarians who had before condemned every thing used for the purpose, except lime white-

¹ Abstract of a paper read by M. B. Church of Grand Rapids at a sanitary convention at Hastings, Mich., Dec. 4, 1888.